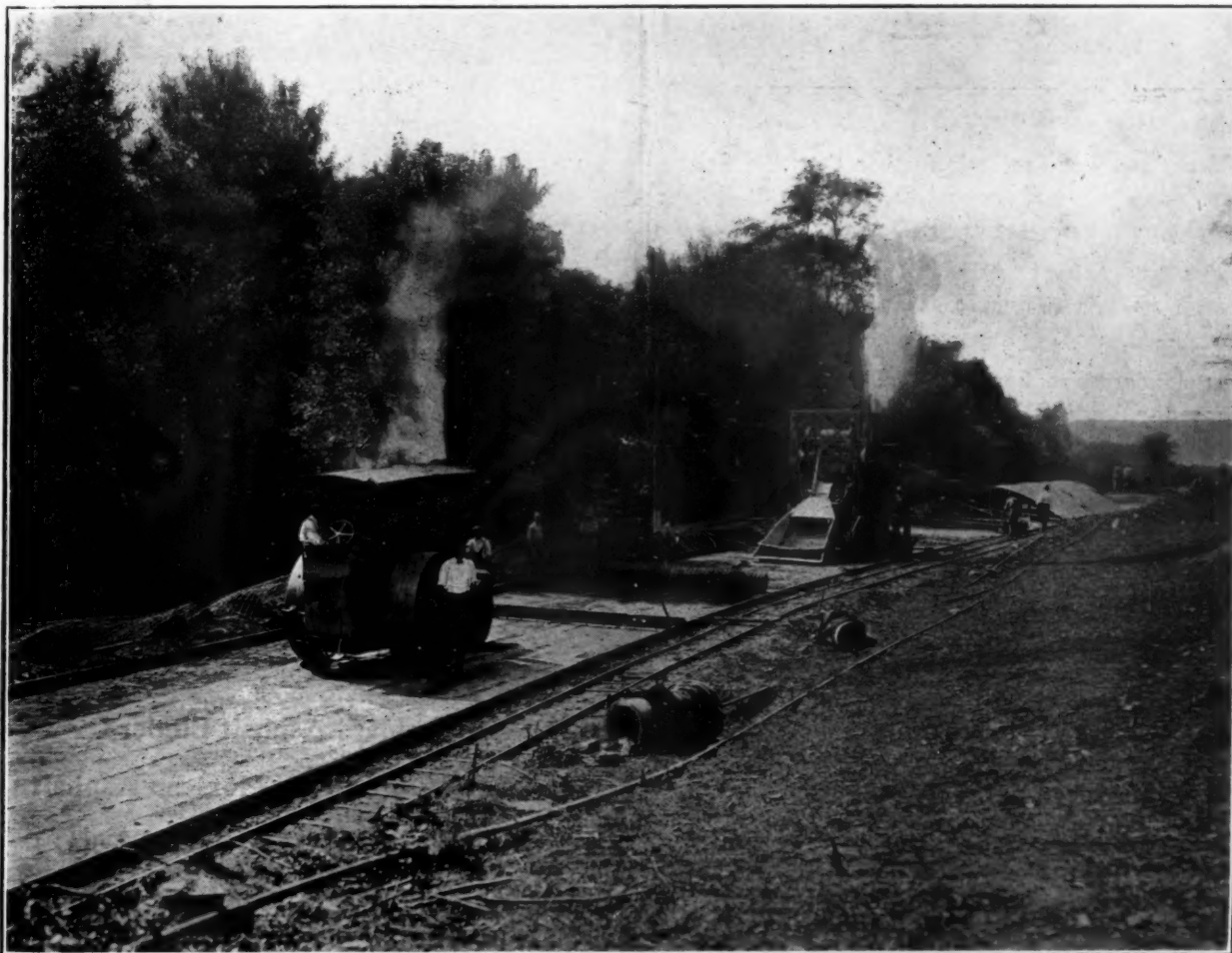


PUBLIC WORKS

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STATE



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MacARTHUR BROTHERS CO.

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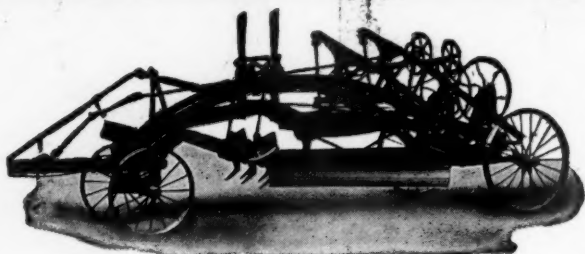
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AUSTIN RIP SNORTER

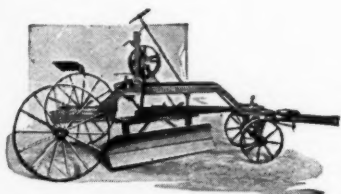
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Vol. 51

NOVEMBER 19, 1921

No. 21

Pennsylvania Highway Department

Developing a state highway system comprising more than 10,000 miles of the 100,000 in a state of 80,000 square miles. Adapting each road to its traffic. General rather than local interest rule in the Primary System; \$50,000,000 are available for the present administration. Six hundred miles of new pavement the 1921 quota.

The state of Pennsylvania, with dimensions of 400 miles east and west and 200 miles north and south, has a total of 100,000 miles of highways, serving a population of about 10,000,000. The diversified topography of the state includes all kinds and conditions of surface with a large proportion of mountainous area under climatic conditions involving heavy rain and snow falls and severe cold in many parts of the state. This makes the highway conditions exceptionally severe, with sections in the northern part of the state in which concrete construction can be carried on for but a limited period on account of frosts.

As the interests of the state are mining, manufacturing, agriculture, and commerce, there is a great diversity of transportation requirements, including heavy freighting as well as the ordinary pleasure traffic and increasing exploitation of scenic routes through the state, which require a great amount of high-class highways, providing both for continuous traffic for their heavy loads and for high speeds, sometimes combined as well as at different times and in different localities.

Up to 1911 the highways throughout the state were entirely under the local control of counties, cities, and townships, the revenues originating by local taxation, but no system of main and connecting roads were then existent.

CREATION OF STATE HIGHWAY SYSTEM

In 1911 a state highway system was adopted by the legislature, embracing 8,800 miles, and at that time provision was made for the appointment of a highway commission and general organization. This highway system as legalized by the legislature was the result of a very comprehensive study by the commissioners and was intended to provide a system of short, improved connections between county seats and centers of

populations; thus serving the many important agricultural and manufacturing centers. Additional lengths were provided where necessary to complete interstate, cross state, and through trunk lines, which substantially provide six north and south routes and six east and west thoroughfares with numerous radial lines connecting intermediate points. This system has since been modified occasionally by successive extensions, duly approved by the legislature, and until the system now comprises 10,200 miles.

PRINCIPLES OF FINANCING

The carrying out of this plan would ultimately involve the expenditure of very many millions of dollars. More than seventy millions have already been made available, derived from legislative appropriations, from current revenues, from the proceeds of a fifty-million dollar bond issue, and from Federal Aid, which has thus far amounted to thirteen millions of dollars.

It was recognized as fundamental that the proceeds of borrowed funds should be applied only to durable construction that will exist at the time of retirement of the bonds. It was, therefore, determined to restrict the application of the proceeds of bond issues entirely to types meeting these requirements, thus eliminating many temporary forms of construction that may be suitable for special cases or purposes and which are properly provided for by current funds. To issue a 30-year bond and construct a type of road that experience has shown will disappear in five years leads, in the opinion of the department, to bankruptcy. It is the belief of the department that the people of Pennsylvania have a right to enjoy their highways while they are paying for them and that their cost may be distributed over a generation.

Governor Sproul, inaugurated in 1919, is a man

of wide business experience, and had taken a tremendous interest in the road system of Pennsylvania, authorized by the bill bearing his name. Believing that the improvement of the highway system is a business proposition, he appointed as commissioner, Lewis S. Sadler, who is not an engineer but whose executive capacity had been demonstrated in connection with the organization and functioning of the Pennsylvania Council of National Defence, and who was especially experienced in large scale financial business.

The first problem confronting the department was the method of apportioning the fifty-million dollar bond issue. There are in Pennsylvania 67 counties of varying size, population and assessed valuation, and naturally the counties that contributed most to the payment of the bond issue demanded the greatest mileage of improved roads.

After careful reflection the administration concluded to ignore all county lines and plan its work on a great trunk line system connecting centers of population, called the "Primary System," the whole cost of which would be borne by the state. This system comprises about 4,000 miles out of the total system of 10,260 miles. The department hopes under favorable conditions to complete approximately 2,000 miles by January 1, 1923, the end of the present administration.

GENERAL BENEFIT POLICY APPROVED BY LOCAL INTERESTS

In Pennsylvania, prior to 1919, as perhaps in most states with limited appropriations, it was utterly impossible for the department to meet even the small demands of the public for improvements, and naturally political influence was brought to bear upon the commissioner to advance this or that project. By 1921 such feeling throughout the state had to be corrected. Empowered by the legislature, the department was determined to construct the Primary System with a view solely to completing the plans and utilizing the facilities for labor and materials offered in the particular sections of the state, rather than to meet the demands and influence of any particular community.

To that end, county commissioners and delegations of prominent and interested people from all sections of the state were invited to come to the office of the department at Harrisburg for the fullest discussion of their local problems and to learn the policy of the department. From January to June, 1919, 36,000 persons visited the department and were interviewed by the commissioner and impressed with the importance of operating along a definite plan, the first of which was the construction of the primary system at the sole cost of the state, and the second part of which was to develop a secondary system leading into the primary system, and composed of highways important locally but not to people of the state at large, the cost of which is to be borne by the local authorities. By this method of approach complete co-operation of the citizens of the state has been obtained. The various counties and townships have been bonded in considerable amounts to carry out this idea for secondary roads.

TYPES AND DIMENSIONS OF PAVEMENTS

The legislature gave the commissioner of highways the greatest freedom in selection of types of construction or sections to be constructed or sequence of operations. In making such decision the department, after an improvement has been authorized, makes a careful survey of the travel that the improvement is likely to bear. If there is promise of heavy truck travel, it is a rule that concrete shall enter in some form into the construction; if a road is to be subjected only to passenger traffic and that of small volume, a bituminous bound macadam road will be considered; but it is taken for granted that in the Primary System the entire mileage will be subjected to such traffic as requires the most durable type.

The width of 18 feet has been fixed as the minimum on the Primary System, with a berm of 3 feet on either side and 2 feet on either side for gutters. This width of pavement permits the easy and safe passage of two motor trucks of the maximum width permitted by law, i. e., 90 inches, without the necessity of traveling on the berms.

A road had been constructed of one-course reinforced concrete between Easton and Allentown, a distance of ten miles, commenced in 1916 and completed early in 1917. This road had been subjected to exceedingly heavy traffic during the period of the war and most careful tests of the 1,080 slabs composing it were made in order to come to some safe conclusion as to its durability. Three hundred and eighty cores were taken from this road by shot drills, and the specimens were found practically perfect, their surfaces showing almost no depreciation. It was concluded to adopt this type with some modification, one of the most important of which was to increase the weight of the reinforcing material and place it within 2 inches of the top.

WIDENING EXISTING ROADS

Traffic has developed to such an extent in Pennsylvania that it is apparent that the present width of most of the highways leading into the metropolitan centers is insufficient. Last year, in this state, the passenger cars made five billion car-miles and there are to-day more than 700,000 licensed motor vehicle registrations as compared with about 10,000 in 1911. Consequently, the legislature of 1921 authorized the widening of the right-of-way for state highways up to 120 feet where necessary.

The Engineering Division is now making a study of the roads leading out of Philadelphia. It is thought that it will be necessary to eventually widen the Lincoln Highway to 80 feet and to construct a pavement 52 feet wide providing for six-line truck traffic for a distance of at least 20 miles outside of Philadelphia. It is not proposed that this extension of width shall be physically accomplished at once, but plans will be filed which serve as notice to property owners, so that construction beyond the limits defined will be made at the risk of the property owners; by which method it is expected that millions of dollars will be saved at the future time when the physical widening shall be required for the convenience of the traveling public.

CONTRACTORS AND EMPLOYEES TREATED SOLELY ON THEIR MERITS

From the commencement of extensive construction, the department was naturally besieged by would-be contractors, endeavoring to secure contracts by political influence; but the commissioner has steadfastly conducted the work on strictly business principles of merit and competition, eliminating all influence and favoritism. He also has assumed supreme authority for hiring and firing employees of the department, whose work is judged solely by its results; merit and efficiency being recognized by advancement, and deficiency by demotion and dismissal. This applies to both construction and clerical forces and has naturally operated to the improvement of the morale, and to the selection and promotion of the most capable assistants.

POST-WAR FUNDS AND CONSTRUCTION

After the authorization of the state highway system, some construction work was commenced but on a comparatively limited scale so that, owing to the war conditions, up to 1919, only 180 miles of road had been constructed in which concrete was used for foundation or surface, although considerable work had been done in the construction of macadam surface of various types, all of which were built and maintained by the state department.

Bids were asked during 1919 for a large mileage; of which 680 miles were put under contract during the fall of 1919. Like other states, Pennsylvania then met conditions of shortages of labor and difficulties of transportation, and experienced an especially wet season, which retarded very materially its progress, but at the end of 1919, 255

miles of this modern type pavement had been completed.

The 1920 construction conditions were still more aggravating, caused by embargo orders of the Interstate Commerce Commission, forbidding the use of box cars and open-top cars for road purposes, and up to the last week of June, 1920, but 5 miles of surfacing was placed. In view of these discouraging conditions most states in the Union stopped all highway construction for the year. Pennsylvania, however, found itself with a thousand miles of its main arterial roads torn up, to the great inconvenience of the traveling public, and concluded to force its construction program at all hazards. With the aid of its Public Service Commission, it procured orders for 1,044 box cars per week for cement and 4,000 open-top cars for sand, gravel and stone, and by the end of the season had completed 413 miles of pavement.

In 1921, the construction season opened early and under favorable circumstances, and on the 15th of October there had been completed during the season 600 miles of modern type paving with the expectation that an additional fifty miles will be completed before the end of the season.

A very interesting feature in the offices of the commission is the graphic presentation of the road system on a large-scale wall map approximately 8 feet by 12 feet, on which the entire system of state highways is shown and lines of colored pins indicate the roads assigned for the improvement during the four years of the administration, with distinctive pins for each year's quota, for finished work, roads under construction and for detours, thus showing at a glance the detail condition of the entire system.

Old Wooden Highway Bridges

Seldom properly designed, built or maintained, intended for lighter loads than present practice, generally old and in dubious condition. Most of them invitations to accidents. Seldom advisable for greater than 15-foot spans.

The short span wooden bridges that are still to be found in almost all rural districts and in some suburban and even urban localities, may be picturesque and quaint, they may add some artistic touch to the landscape and they may even carry traffic, with limitations, but 99 per cent of them should be shot at sunrise, and the remainder should be held guilty of being unsafe or unsuitable until proven innocent, with the exception of a negligible proportion that may be found in mountainous and heavily wooded regions where timber is large and abundant and traffic is very light.

The indictments against ordinary wooden highway bridges contains many serious counts; they are seldom properly designed and proportioned.

They are seldom well built of first-class materials.

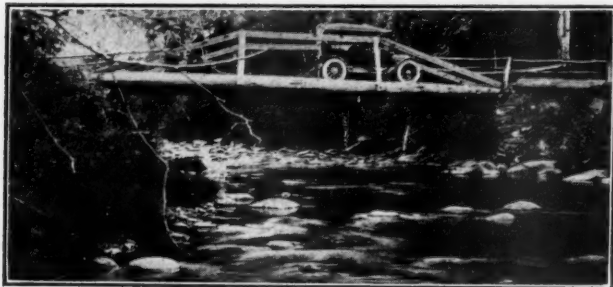
They are seldom properly inspected and maintained.

They are almost invariably intended, so far as any acceptable designs go, for very much lighter loads than the maximum likely to be imposed.

Most of them are of dubious character on account of their age and infirmities, since for years the tendency has been to make all new bridges and replace old ones with steel or concrete.

Less than three years ago the state highway department of Pennsylvania announced that "all bridges on the state's primary system, for which the state is responsible, are to be rebuilt."

As this broad statement included not only wooden, but iron, steel, concrete and stone bridges the replacement obviously could not be immediately carried out, and on the little traveled roads, although they may not be of the primary state system, there are doubtless many bridges still in service in Pennsylvania, and in most other states, that correspond to the group of old set-



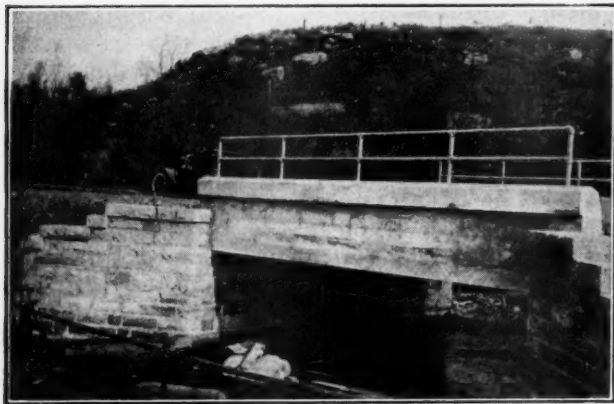
QUEEN POST TRUSS POORLY FRAMED AND ON DILAPIDATED ABUTMENTS

plers illustrated by the accompanying pictures, selected from the files of the Pennsylvania State Department of Highways, merely to illustrate the general character and appearance of many old hit-or-miss structures still in service and, in Pennsylvania at least, being replaced as fast as may be with real bridges of girder or arch type, whose appearance, as in the single example herewith, especially when contrasted with such wooden bridges that have managed to get by for a long time, inspires confidence in the strength, stability and durability of concrete structures.

A concrete bridge, built with anything like proper design and supervision will, to be sure, cost much more than a makeshift wooden bridge, but in the end will be far more economical on account of the practically unlimited life, lack of maintenance expenses, capacity for any possible loading, and the assurances that it gives against losses by flood or fire or damages to itself or traffic.

Although the old wooden bridges illustrated indicate effort to make the simplest possible type of truss construction, namely the king-post or queen-post truss, they show, except in the case of the covered bridge, where the details are hidden but suggestively better, a most lamentable lack of any idea of adequate proportioning, detailing or workmanship so that the pretence of trussing probably adds the lowest minimum to the strength of the horizontal members as girders and may indeed diminish it.

The dilapidated substructures have their counterparts all over the country, and are an invitation for a wash-out in the first heavy freshet or destruction by running ice. If these perils are es-



CONCRETE GIRDER SPAN WITH HEAVY MASONRY ABUTMENTS AND WING WALLS

caped there is always more than possibility that the decay visible or concealed or weather-checks, or both, are progressively reducing the original strength of the bridge so that some day it will suddenly fail under loads that it has heretofore carried.

It is by no means impossible to build an excellent wooden short span bridge, but the moment it exceeds a 15-foot span its design, construction and maintenance should be in the engineering department and in most cases such a bridge should nowadays be built only for emergency, for very light traffic where conditions are such that there is not danger of their use by automobiles, trucks or road machinery, or for temporary service such as that of a short period by-pass or detour.

Essentials of Wooden Highway Spans

Restricted selection of type and dimensions. Correct design. First-class materials and workmanship. Proper inspection and maintenance. Restriction of traffic.

In general the use of wooden highway bridges should be entirely prohibited in cities and large towns and should be permitted only for temporary service or for very short spans and light selected traffic, or for emergency or for very remote or mountainous districts in other places.

Steel and concrete bridges can be made far stronger, more reliable and more durable, are, when well built, less subject to injury and deterioration, are likely to be better built and designed and are less likely to fail from overload.

The use of wooden bridges is a standing temptation to every carpenter, wood butcher and construction foreman or town commissioner to be his own engineer and mechanic, to work without proper supervision, to build in ignorance or regardless of present essentials and future requirements, and is likely to be responsible for hasty construction, inadequate strength and the use of poor materials badly fabricated.

Generally these bridges are most permissible for very short spans over small brooks, for replacing culverts or over swamps or narrow valleys where they are supported on pile bents up to a maximum of 16 feet apart. In such cases they may be made of heavy timber, forming simple full length girders, used in pairs and multiples of pair laid close enough together to carry any load that can possibly be permitted to be imposed. Ordinarily the length of spans would be limited by the available length of large sawed timber to make the tension member of the truss, preferable of the king-post or queen-post type, which will usually suffice for the unsplined chords.

For longer spans no safer or more durable wooden construction has been devised than the old-fashioned Towne lattice girder, put together with wooden pins and protected by a shingled

roof. Many of these have been replaced by light steel trusses that were neither as strong, as rigid, as durable or as economical as the old wooden spans. The ordinary limit of length for this type was about 100 feet and the principal difficulties encountered were in securing proper camber, lateral bracing and adjustments. Still longer spans have been successfully built with combination Howe trusses, but these may be objectionable because of the comparatively large amount of steel and cast iron required for tension members and details. At the present time their use will be seldom justified, except in very heavily timbered or mountainous localities.

For ordinary spans up to 20 or 30 feet, king and queen-post trusses are simple, efficient and are easily constructed from moderate size timber with single piece lengths for bottom chords and screw end rods for vertical tension members. Care should, of course, be taken to have the inclined and horizontal members of the truss properly proportioned for their respective stresses, the ends should be carefully seated to full bearing, with hard wood blocks or castings to receive the nuts and washers of the vertical rods.

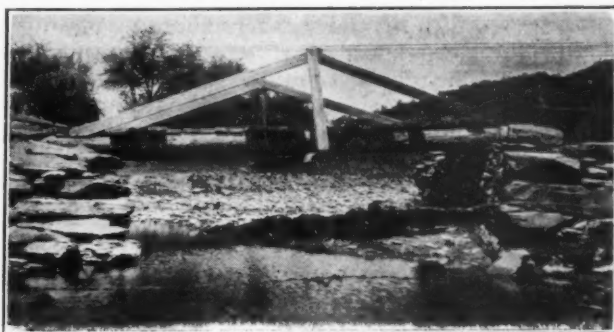
At panel points and sometimes at intermediate points the floor beams should be rigidly secured to the lower chords and project beyond them to receive the ends of sturdy, well-fitted inclined struts, bracing the trusses in vertical planes.

The ends of the trusses should have ample bearings, carefully adjusted on smooth horizontal stone or concrete surfaces, or on heavy timber sills, and in either case they should be well exposed to light and air and thoroughly drained.



KING POST TRUSS WITH SLENDER TOP CHORDS

The floor should consist of heavy hardwood planks carried on transverse floor beams or for very narrow roadways, may be supported directly on the lower chords of the trusses when the latter are especially proportioned to carry both bending and compressive strain. The floor planks and beams should never be proportioned by guess, but the sizes and spacing should be accurately determined by selection from tables of strength that are found in all engineering handbooks. The floor planks should be securely spiked in place and economy and durability may often be promoted by making the floor in two layers so that the upper course may be worn very thin before renewal without impairing the strength of the lower course whose life can thus be greatly prolonged and the cost of renewal be decreased. In this case the lower course should be laid with clearance



KING POST TRUSS WITH POOR DETAILS

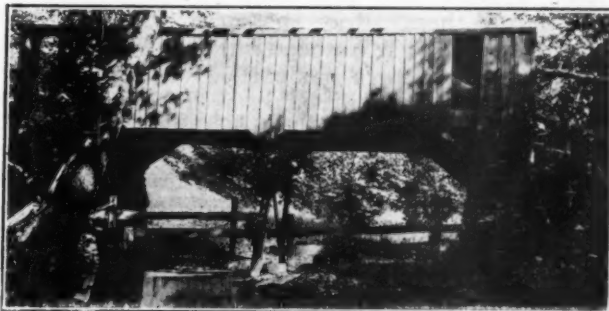
between the boards for ventilation and drainage and the upper course may be laid diagonally, giving great additional lateral stiffness to the bridge.

It should be kept in mind that the floor is the weakest part of the bridge and must be proportioned for the heaviest possible concentration of live load at all points, and for maximum loading throughout.

Care should be taken to have the road grade descending, if possible, from both ends of the bridge to avoid excessive impact of sudden loads; the bridge should be transverse to line of the street if possible; should be well protected by substantial handrails, wheel and hub guards, and should have prominent notices regulating traffic and speed.

A clear and complete plan and elevation of the bridge should be provided together with the record book with proper instructions, headings, and rulings for periodical inspection that should be made every three or six months by a reliable carpenter foreman, and at least once a year by an engineer. The inspection should give particular attention to the stability of the piers and abutments, the nature of the bottom and any indications of scour or danger from freshets, noting any repairs to the masonry or wing walls. Special pains should be taken to examine all of the bearings of the trusses, beams and girders and their joints and connection at all places where there is a possibility for moisture to collect or dirt and rubbish to gather. These places should be cleaned and dried and, if necessary, provided with drainage for snow and rain water.

The timber should be carefully examined for decay and large pieces should occasionally be bored with a small bit to determine whether they are sound throughout. Bolts and screw rods should be kept adjusted, but not too tight, iron



QUEEN POST TRUSS COVERED BRIDGE

and steel rods, nuts and washers should be painted, but no paint should ever be put on the timber. Defective floor planks should be replaced as soon as noted and if repairs to the trusses themselves are needed they should be made under engineering supervision.

If the passage of loads heavier than the bridge is designed for is unavoidable, heavy longitudinal planks should be provided to distribute the wheel loads over the floor, and the latter should be shored up at panel points or under the girders at short intervals if the bridge is of simple girder construction.

Maintenance of Sewerage Systems

Some features from Baltimore practice—obstructions, catchbasins, manhole covers, lamp-holes, flush-tanks, pumping stations, etc.

In a paper before the American Society for Municipal Improvements, Milton J. Ruark, division engineer of sewers of Baltimore, discussed at some length many of the features of maintaining the sewer system of that city which seemed to deserve special mention or offer valuable information for others in charge of sewerage systems. The sewers and storm water drains of Baltimore were built almost entirely between the years 1906 and 1916 and therefore have an average age of about ten years. The following is an abstract of his paper:

Obstructions.—Perhaps the chief aim of the engineer in charge of a sewerage system is to maintain it free of obstruction and odors. Designing sewers with sufficient grade does not necessarily insure this, for even more important than grade is the selection of a good quality of pipe and the skilful laying of it. The pipe should be smooth and straight and laid in continuous straight alignment between manholes, with each joint made as tight as practicable.

One of the chief causes of obstructed sewers is tree roots. Tight joints greatly reduce the probability of obstruction of sewers from this cause. Poplar trees are those responsible for most of this trouble in Baltimore. Because of this and because poplar trees have little value as shade trees a Baltimore ordinance prohibits further planting of them. Root obstruction occurs more frequently in house connections than in the street sewers. Roots have not caused obstructions in storm water drains, probably because they carry little or no flow during dry weather. Roots find their way into sanitary sewers, however, even where bituminous joints have been used.

Catchbasins.—"With the exception of a few low-lying drainage areas, there are no catchbasins in Baltimore and it is not likely that any will be built in the future. Most of the storm water drains are self-cleaning, and the building of catchbasins would therefore serve no useful purpose

but they would probably become nuisances. Catchbasins are very expensive to clean out. They soon fill up with silt and it is difficult if not impossible to prevent street sweepers from disposing of street sweepings in these inlets in order to lessen their labor. Furthermore, catchbasins often retain a good deal of decomposed matter and they cause complaints because of odors and prevent a free circulation of air through the drainage system."

Manhole Covers.—Covers for manholes on sanitary sewers and for those on storm water drains should be clearly marked so that any municipal employee can tell which kind of a sewer it covers, and in addition the size should differ so that the covers cannot be interchanged. Unless this is done there may be much confusion in maintenance work, and other troubles may arise, such as the dumping of snow into the manholes of small sanitary sewers under the impression that it is being deposited in storm water drains.

When the Baltimore sewers were first built, each cover was provided with six one-inch holes for ventilation. Later all but two of these have been omitted, these two being left for use in removing the cover, since the omission of traps on house connections provides ample ventilation of the sewers without using the manholes for this purpose. The elimination of these openings prevents considerable surface water from flowing into the sewer and adding to the cost of treatment of the sewage.

Complaints have been made because of loose manhole covers which rattle when traffic passes over them. It has been found at Baltimore that the best remedy for this is to have all manhole frames and covers inspected at the foundry and accept only those that fit well. The city buys the heads and covers and furnishes them to the contractors.

Lamp Holes and Standpipes.—Some lamp holes were included in the Baltimore sewers when first built, but they have been discontinued as they are of little or no value for clearing the sewers and seldom facilitate maintenance work in any manner whatever; while the covers are so light that they are removed by children, who drop sticks and rubbish into the sewers through them; and in addition the lamp hole, no matter how carefully constructed, is apt to settle and break away from the lateral sewer.

Standpipes as part of the house connections in deep sewers have also been the source of much trouble, owing chiefly to settlement.

Garage Connections.—It is unlawful in Baltimore to conduct garage floor drainage into the sanitary sewers and there has been no record of explosions in any of the Baltimore sewers. Such drainage can be connected to the storm water drains, the plumbing regulations requiring, however, that an approved trap of ample capacity be installed on the house side of the sewer connection so as to intercept any gasoline or oils that might otherwise flow into the storm sewer.

Flush Tanks and Flushing Connections.—Originally 1½-inch taps from the water mains to each terminal or dead-end manhole were constructed

to permit flushing the sewers when necessary. This practice has been discontinued as it has been found that flushing is necessary only occasionally, and that the connections often rust out and become leaky in a short time. Flush tanks also are no longer used except at the heads of very flat grades, and Mr. Ruark questioned whether they were desirable even there. There have been few complaints of deposits in sewers at or near the upper ends of the laterals.

In Baltimore four men spend all their time making periodical inspections of manholes and removing from manhole benches such things as sticks, rags, bottles and other materials that might choke the sewer. When they find sewers partially obstructed, they immediately have these obstructions removed, which prompt attention reduces the annual expenditure for cleaning sewers and also reduces the complaints of flooded cellars.

Sewage Pumping Stations—The main pumping station at Baltimore pumps an average flow of 25 million gallons a day, which has reached a maximum of 38 million, and has been in continuous service without interruption since it was installed. The writer calls attention to the necessity of securing such continuity of service, any interruption of which would be a serious calamity. This necessitates duplicate apparatus kept in condition for instant satisfactory service.

The Baltimore station has also demonstrated that a sewage pumping station can be operated in the midst of a congested district and the sewage screenings disposed of therein by incineration without causing a nuisance.

In conclusion, Mr. Ruark remarks that while great advances have been made in sewer design during the past ten or fifteen years, much remains to be done. "Engineers should ascertain with a greater degree of accuracy the value and advisability of using concrete for sewers as compared with terra cotta vitrified pipe; the effect by various kinds of sewage and industrial waste flowing under different velocities and conditions in both concrete and brick lined sewers, and the life of these materials under such conditions. Engineers should, as a matter of public service, make a more detailed study of the storm water run-off from various kinds of pavements, etc., the percentage of water entering different types of inlets under varying surface grades and conditions."

Creosoted Timber for Highway Construction

The Bureau of Public Roads, United States Department of Agriculture, has recently instructed its engineers to use timber creosoted by the vacuum and pressure methods where justified on economic grounds. The instructions issued in January practically prohibited the use of timber for highway construction purposes and were generally considered by state, county, city and other engineers to mean that the government disapproved of the use of well-creosoted timber. The recent instructions state that:

"The economic advantages of trestle construction in some sections of the country are so clear and local timber supplies are sometimes available

on such terms as to make it advantageous to use timber for long bridge approaches across river bottoms or for swamp and marsh crossings. The statement of policy made in the general letter of January 20, 1921, is to be adhered to, but where under that letter the district engineer is prepared to recommend the use of timber, the bureau will not question the use of creosoted material where the following conditions are observed:

"Timber trestles or bridges constructed of creosoted material treated by the vacuum and pressure method.

"Timber floors constructed of creosoted plank laid laterally with a plain or tank treated wearing floor ('half-sole'); or laid laterally or longitudinally on edge, spiked together, and covered with a mastic wearing course.

"Timber floors for light traffic where single floors are laid and not protected by any covering constructed of tank-treated material or plain material depending on whether plain timber is more likely to rot out or wear out.

"This communication is not to be construed as an endorsement of this type of construction, or to let down the bar to its general use, but to define procedure when conditions of traffic and economy require consideration of timber construction.

"P. ST. J. WILSON,
"Chief Engineer."

Large Church Moved for Street Widening

By E. Dauenbauer*

The 4,500-ton brick St. Nicholas Church, Pittsburgh, raised 8½ feet and moved 20 feet horizontally without interrupting the services.

Owing to the widening of East Ohio street, N. S., Pittsburgh, Pa., the St. Nicholas R. C. Church building had to be moved back 20 feet. The 65 x 110-foot building is of heavy brick construction with large towers on two corners. The slate roof is supported by the outside walls and by eight columns in two rows. The interior of the walls, the Altar, Sacristy and the arches are all beautifully decorated. The windows are of art glass. Approximate weight of building, 4,500 tons.

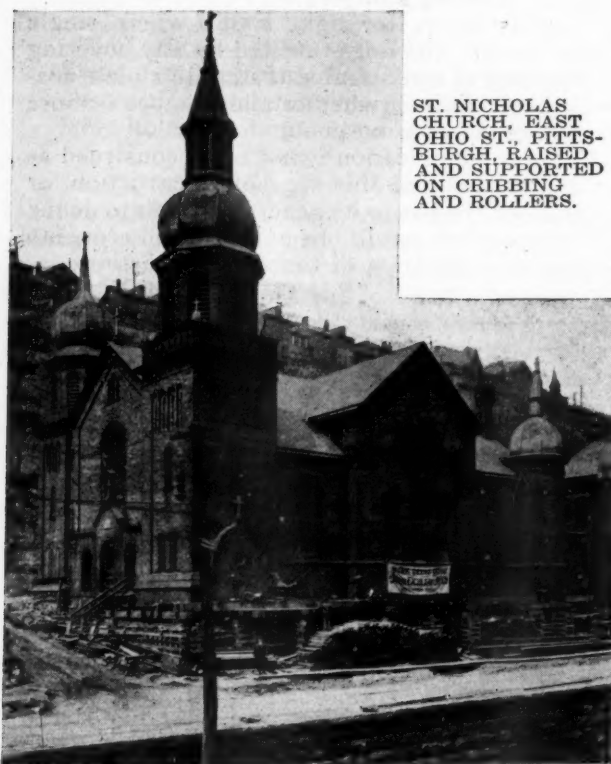
As the church was built against a steep hillside, it was necessary to remove about 3,000 cubic yards of earth with a steam shovel to provide clearance in the rear for its new position.

The building was loaded on twelve 14 x 16-inch running timbers on top of which other timbers were placed transversely, and upon these the walls of the building were supported by 8-inch steel I-beam needles placed in clusters of 2, 3 and 4 approximately 3 feet from center to center.

*Of the John Eichleay, Jr., Co., Pittsburgh.

Eight hundred 20-ton jack screws were then placed on cribbing directly under the 12 running timbers and the building was raised 8 feet 6 inches. Eighty-five-pound steel rails were placed on the twelve lines of cribbing, and 1,000 3-inch steel rollers with steel plates over these were set directly under the running timbers, the jack screws were released, and the building was ready for moving.

This was accomplished by ten drums containing jack screws placed against the running timbers and operated by hand bars. The 20-foot move was accomplished in 18 hours. The building was then taken on jacks again and set level and plumb. New foundation walls were built, the building securely underpinned and the timbers, I-beams and jacks removed.



ST. NICHOLAS CHURCH, EAST OHIO ST., PITTSBURGH, RAISED AND SUPPORTED ON CRIBBING AND ROLLERS.

Special care had to be exercised to keep the building level and plumb at all times to prevent cracking. This was done by checking up with an instrument to remedy any settlement that might have occurred.

The entire operation was accomplished without damage. All services were held as usual, lighting, heating, sanitary services and temporary means of entrance during the progress of the work were maintained.

University of Michigan's Highway Course

The University of Michigan has made public its 1921-22 schedule of short period advanced courses in highway engineering and highway transport. These courses are intended for men actually engaged in the practice of highway engineering and highway transport and each extends over two weeks. Five two-weeks' courses extend in continuous succession from December 5 to Feb-

ruary 10, a sixth from February 20 to March 3, and the seventh from March 6 to 17. The instruction is to be given by Professors Blanchard, Smith, Bateman, Riggs, Lay and Gram.

The seven courses are as follows:

1. "Earth, Sand-Clay, Gravel and Broken Stone Roads." "American and English Highway Transport Methods."
2. "Highway Engineering, Financing, Management and Organization." "Highway Transport Legislation and Traffic Legislations."
3. "Grading Machinery and Operations." "Interrelationship of Highway, Railway and Waterway Transport."
4. "Bituminous Surfaces and Bituminous Pavements." "Highway Transport Costs and Record Systems."
5. "Mechanism, Operation and Maintenance of Motor Trucks, Tractors and Trailers." "Highway Laboratory Research." "Highway Structures." "Highway Transport Management."
6. "Highway Transport Economics and Surveys." "Brick, Cement-Concrete, Stone Block and Wood Block Pavements."
7. "Highway Specifications, Contracts and Jurisprudence." "Highway Engineering Seminar." "Highway Engineering Theory and Design." "Highway Transport Seminar."

New Centrifugal Pumps for Chicago

Two 60,000,000 - gallon turbine - driven pumps selected on considerations of operating cost, experience and financial rating of bidder, time of shipment and design.

The Springfield Avenue station, which is one of a group of large stations supplying water to the city of Chicago, derives its supply from the northwest tunnel system, and several years ago had an average daily pumpage of 75,000,000 gallons and a maximum of 170,000,000 gallons, distributed over a residential district covering about 33 square miles in the western part of the city.

The equipment in 1919 consisted of three 20,000,000 and one 40,000,000-gallon vertical, triple expansion pumping engines and one 25,000,000-gallon, turbine-driven, centrifugal pump, all designed to work against a total head of 125 feet.

As the population increased and the demands upon the station became greater, it became increasingly difficult to maintain the required pressures.

After a study of the then existing conditions, it was decided to remove one of the old 20,000,000-gallon reciprocating pumps and install two 60,000,000-gallon, turbine-driven centrifugals designed to work against a total head of 150 feet. When completed, these two 60,000,000-gallon pumps, working at their most efficient rating, will meet the entire maximum demand upon the station and maintain the required pressures throughout the district.

The main pump of each unit is a De Laval centrifugal with a designed capacity of 60,000,000 gallons per 24 hours against a total head of 150 feet. A De Laval steam turbine drives the pump through a set of De Laval gears. The turbine operates at 3,800 r. p. m. and the pump at 530, giving a reduction of 7.2 to 1. Steam is supplied at 175 pounds pressure and 150 degrees Fahrenheit superheat. The circulating pump, which is operated on an extension of the main pump shaft, has a capacity of 3,500 g. p. m. against a head of 12 feet. Each unit, including all its auxiliaries, is guaranteed to develop not less than 152,000,000 foot-pounds of work per 1,000 pounds of steam.

The turbine exhausts into a C. W. Wheeler surface condenser 54 inches in diameter and 19 feet 3 inches long with 4,550 square feet of surface in the tubes. The air and condensate pumps were also supplied by the same company. An atmospheric exhaust valve is provided.

The equipment described is being installed with day labor by the Bureau of Engineering of the city of Chicago, under the general direction of Alexander Murdoch, city engineer.

The new pumps each occupy a great deal less space than the reciprocating pump they replace, as is indicated by the diagram of one of the new pumps and one of the old pumps of only two-thirds its capacity.

In selecting the 120,000,000-gallon pumps, turbines, and gears, the choice between bids was made on a consideration of operating costs estimated on the annual fixed charges taken at 10 per cent of the bid price, and of the duty guarantee under normal operating conditions; the experience the bidders had had in manufacturing

similar machinery that includes at least one water works pumping unit of approximately the same size for each of three different cities, all of which have been in regular service for three years; the dates of promised shipments of plant to Chicago; and the characteristics and details of design as indicated by the principal drawings and by curves showing the pump efficiency and brake horse-power for a range of pressure heads from 80 feet to 160 feet. No bids were considered that did not guarantee a minimum duty of 130,000,000 foot-pounds per 1,000 pounds of steam.

Each unit consists of a steam turbine, a reduction gear, a main centrifugal pump and a circulating centrifugal pump connected together with flexible couplings of the "pin and bushing type."

The turbine is of the horizontal shaft, multiple-stage, impulse type, developing the full rated capacity of the pump at 4,000 r.p.m. with a peripheral speed, at the centers of the buckets, not exceeding 650 feet per second under any condition.

The turbine is built for normal steam conditions of 175 pounds gauge and 150 degrees superheat and 28½ inches vacuum and is capable of operation to full rated capacity with pressure of 150 pounds and 100 degrees superheat or under maximum conditions of 210 pounds i.s.p. and 200 degrees superheat at turbine inlet.

The casing is split horizontally and arranged to permit removal of top half without disturbing steam or exhaust connections.

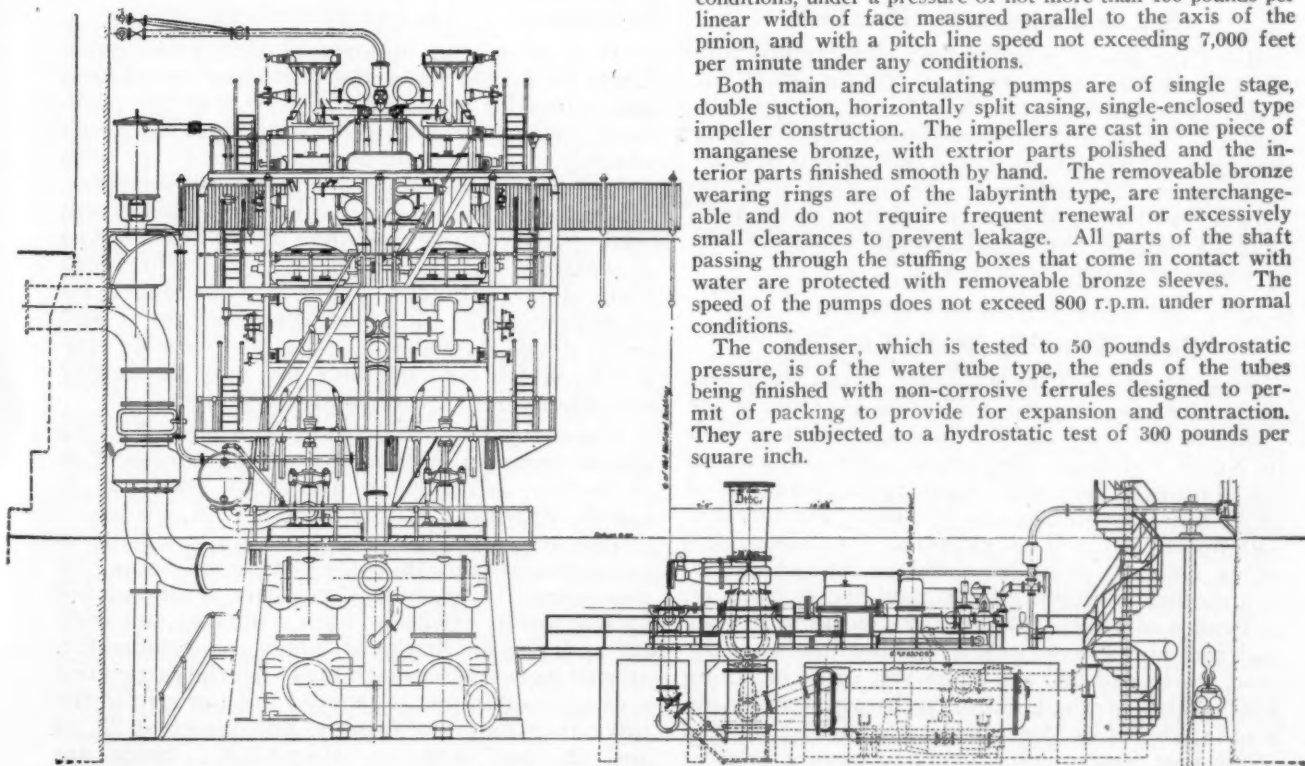
The buckets, nozzles and guide vanes are renewable. The turbine wheel and shaft are cable of operation up to 10 per cent above normal. All bearings are split in half and are designed for forced lubrication.

While the turbine is in operation its speed can be adjusted within limits of 5 per cent above or below normal and within a variation of two degrees either side of the adjustment speed.

The reduction gears are of a type that have been proved durable and efficient under continuous waterworks or power plant service of three years. They are of the double helical type with polished teeth operating under normal conditions, under a pressure of not more than 400 pounds per linear width of face measured parallel to the axis of the pinion, and with a pitch line speed not exceeding 7,000 feet per minute under any conditions.

Both main and circulating pumps are of single stage, double suction, horizontally split casing, single-enclosed type impeller construction. The impellers are cast in one piece of manganese bronze, with exterior parts polished and the interior parts finished smooth by hand. The removeable bronze wearing rings are of the labyrinth type, are interchangeable and do not require frequent renewal or excessively small clearances to prevent leakage. All parts of the shaft passing through the stuffing boxes that come in contact with water are protected with removeable bronze sleeves. The speed of the pumps does not exceed 800 r.p.m. under normal conditions.

The condenser, which is tested to 50 pounds dydrostatic pressure, is of the water tube type, the ends of the tubes being finished with non-corrosive ferrules designed to permit of packing to provide for expansion and contraction. They are subjected to a hydrostatic test of 300 pounds per square inch.



LONGITUDINAL SECTION OF SPRINGFIELD AVENUE PUMPING STATION SHOWING RELATIVE POSITIONS AND SPACES OCCUPIED BY 40,000,000 GALLON TRIPLE EXPANSION PUMP AND BY 60,000,000 GALLON STEAM TURBINE DRIVEN CENTRIFUGAL PUMP.

There is a rotative crank and fly wheel dry vacuum pump with waterproof cylinders, and there are two duplex, direct acting condenser pumps for alternate service. The speed is controlled by a valve operated by a float in a damper attached to the condenser hot well and does not exceed 15 feet per minute under normal conditions.

The two pumps deliver the condensate against a head of 73 feet and, with the condenser, are designed to make a vacuum of not less than $28\frac{1}{2}$ inches under normal conditions with water entering at 70 degrees with a terminal difference of not more than 10 degrees, and with 1 square foot of surface for 5 pounds of steam consumed per hour by the main unit and all its auxiliaries.

The equipment installed was tested by the manufacturer at the shop for pressure, overspeed, and balance, and the pumping units were assembled and subjected to efficiency tests at the shop.

At the end of the 30-day probationary period the city will conduct field tests of not less than four hours and not more than ten hours' duration to demonstrate capacity and duty. The units will then be required to deliver not less than 41,677 gallons per minute throughout the duration of the tests. The result for duty tests will be corrected for variations from normal steam, superheat and water temperature in accordance with correction curves furnished by the bidder with his proposal. In case the results of the field tests show an actual duty development less than the guaranteed duty, the equipment may be accepted at a reduction in price equal to five times the difference between the annual fuel charge based on the duty obtained by the field test, and the annual fuel charge based on the guaranteed duty. No unit will be accepted if the duty developed during field test is less than 130,000,000 foot-pounds per 1,000 pounds of steam.

City Commissioners Recalled

Bay City, Mich., recalled four city commissioners October 11 by more than 600 majority, the principal reason assigned being that the commission had appointed an out-of-town man as city manager, which manager has not proved popular with many of the citizens. The election to fill the vacancy will be held shortly and it is understood that all four of the recalled commissioners will be candidates for re-election.

Road Work in North Carolina

State Highway Commissioner Frank Page and State Highway Engineer Charles M. Upham are proud of the record of the past six months' work in North Carolina. Beginning with contracting for 34 miles in July, the August lettings amounted to 41 miles, September to 85 miles, and October 130 miles, while it is expected that about 150 miles will be let in November. At present 80 contractors employing 6,500 men are at work on 896 miles of road, 3,200 men are working in rock quarries and gravel pits in connection with the road work, and 900 are employed in maintaining 4,500 miles of road. The highway commission was organized in May of this year and by the end of its first fiscal year expects to have a total of 1,500 miles under construction and 5,000 under maintenance.

Paving Brick Specifications

The Committee on Specifications for Brick Paving of the A. S. M. I., in reporting to the Baltimore convention, stated that it had rewritten the paving specifications in an effort to bring them up to date and provide for the construction of the best type of brick pavements.

The committee quotes from an editorial in *PUBLIC WORKS* on September 17 as follows: "With demands for wire-cut brick, repressed, sharp edges, rounded edges, vertical fibre, etc., it does not seem possible that one standard can be adopted, but it does seem perfectly feasible to reduce the number to three or four, and it is to be hoped that such will be the result of the combined efforts of the various associations and departments now working to this end," which opinion the committee agrees with.

The committee considered carefully and at length the advisability of providing specifications for a plain wire-cut brick without lugs, for use with an asphalt filler applied by the squeegee method, having been informed that this type has been used in certain sections of the country and is being specified by engineers in still other sections. It decided, however, to consider the matter for another year and investigate the type of construction before including it in the specifications.

"Specifications for a tar mastic and also for an asphalt mastic bed were considered. The committee was informed of the development in recent years of this type of construction, but also decided to hold this subject open for another year to give opportunity for further observation and investigation of this type of construction.

'It is of special importance that brick pavements be placed upon the particular foundation best suited for economy and service of the pavement; that is, when a rigid base is used, the brick wearing surface should be either a rigid type with cement grout filler of flexible type with soft filler. When the flexible base (all other materials except cement concrete) is used, then only a flexible type of wearing surface should be used. The judgment of the engineer should be depended upon to properly adapt and adjust the principles as well as the details of construction to the variable conditions which confront him, not only in his city as a whole, but in each separate project.

The committee consisted of George F. Fisk, assistant engineer in charge of paving construction of Buffalo, as chairman, and D. B. Davis, E. B. Ulrich, Edward E. Duff, Jr., and E. A. Fisher.

The new specifications differ quite a little in arrangement and in some details of actual requirements from those previously recommended by the society. Hillside, both repressed and wire-cut, and wire-cut bricks with lugs are provided for, as well as repressed with lugs. In the rattler test the variation in loss is reduced to 6 per cent in the brick from any one factory, and losses of 22, 24 and 26 per cent on $3\frac{1}{2} \times 4 \times 8\frac{1}{2}$ brick are provided for heavy, medium and light traffic streets, respectively.

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Tunneling Efficiency

Although tunnel construction is likely to be often dangerous, uncertain, costly and slow and to involve elaborate and expensive methods of appliances, there are occasions when tunnels, especially those of small diameter, can be driven rapidly and safely with simple methods and equipment if favorable conditions are predetermined and the work is handled by a competent contractor under careful supervision, as is the case with the Milwaukee water supply tunnel, to be described in our next issue.

Here the engineer and contractor have successfully co-operated and the work has advanced steadily, without accident, with a small force and simple standard appliances. Sufficient time having been allowed for the execution of the work it sufficed to provide construction plants at only one of the two shafts and shift it to the other shaft when the proper proportion of work had been done at the first shaft, thus saving considerable outlay for equipment.

Although the ground encountered was generally good solid clay there were treacherous places

where the use of compressed air was an important safeguard against falling roof and also helped to prevent an undue inflow of ground water and the tunnel has therefore been driven under a moderate air pressure, but without the greatly increased expense of installing and operating a hydraulic shield that would necessarily have made the work much slower.

Another economy was effected by making the concrete tunnel lining itself a part of the air lock in combination with transverse steel bulkheads, and it was considered that the loss of air occasioned by the extra length of the air lock, was compensated for by the greater rapidity and convenience of passing materials through it than through a much shorter steel lock.

Ample and continuous protection from falling roof was provided by the use of special arch timbering made of heavy planks battened together in pairs and rapidly adjusted when necessary by wedges at the joints of the segments.

The excavation was greatly promoted by the use of pneumatic tools for penetrating the very hard clay, which was subsequently easily pried off without the delay, danger or expense of blasting and without involving the removal of poisonous gas or powder fumes.

The timely detection of poisonous or explosive gases, which fortunately have not yet appeared, has been provided for by the daily tests of samples of the tunnel's air, which, although of a negative nature, are quickly and easily made and are considered ample to give timely warning of danger.

What Can a Health Department Do?

One of the most important duties and responsibilities placed upon the boards of health of many of the states is that of protecting the general health by securing the construction of sewage treatment plants. In some cases moral suasion is sufficient to secure such construction, but it is becoming apparent that health boards must be provided with some power and authority to compel compliance with orders for construction of sewage treatment that it may give to the several communities of the state.

In some states the health board has exerted pressure by refusing to permit a city to construct any more sewers until it has built a disposal plant. In at least one Pennsylvania city of considerable size, no sewers for receiving house sewage have been constructed during the 15 years since the state health board made such a ruling, because the people will not vote the necessary funds for building the sewage treatment plant. The failure to provide sewers for the newly developing sections of the city, as well as for the considerable number of older sections where such sewers had not previously been built, is undoubtedly causing to an increasing extent an insani- tary condition in that city. It would seem as though some way might be found for permitting the health board to bring pressure on a city in some way that does not itself threaten the health of its citizens.

Another difficulty that sometimes rises is illus-

trated by a statement made elsewhere in this issue of PUBLIC WORKS. A New Jersey town, ordered to build a sewerage system, calls to the attention of the state board the fact that to do so would necessitate its raising more money by a bond issue than it could do without exceeding the limit of indebtedness established by state law.

It suggests itself that conditions such as the latter one described, and possibly the other also, might be met by the plan of having the state give to the state health board the power and the necessary credit to permit it to construct itself any plant which a town will not or cannot provide at the order of the board, charging the cost of the same against the town with reasonable interest and allowing the town a certain number of years to pay the indebtedness to the state thus incurred.

In this connection it may be recalled that in Pennsylvania it was proposed a few years ago that, in view of the fact that a sewage treatment plant is of much more benefit to other citizens of the state than to those of the city that erects it, a part of the cost of all sewage treatment plants (50 per cent was suggested) should be borne by the state at large. There is much to be said in favor of this proposal.

It is greatly to the credit of both Pennsylvania and New Jersey and of a number of the other states of the country that scores of cities, towns and villages have installed sewage treatment plants either of their own volition or in willing compliance with the requests of their state health boards; but it is apparent from a number of instances similar to those above that in order to meet such recalcitrant communities, state health boards should be given more power and authority, to be used only as a last resort.

Robert Louis Stevenson on Engineering

Among the very best of the annual reports issued by municipal departments that reach this office are those of the water Commissioner of St. Louis, Edward E. Wall. One feature of these reports that always attracts our attention is not a part of the report at all, but is a quotation from some author of high repute which has direct interest for the engineer or water works man and is printed immediately preceding the report. That found in the report for 1920-21 is given below because of its keen analysis and clear, brief statement of an important element of engineering. Most of our readers do not need to be reminded that Robert Louis Stevenson was the son of a famous British engineer, and perhaps would have himself followed that profession had not his weak constitution interfered to make him the best loved writer of the finest English of the last half century.

*** And in truth what the engineer most properly deals with is that which can be measured, weighed and numbered. ***

These are the certainties of the engineer; so far he finds a solid footing and clear views. But the province of formulas and constants is restricted. Even the mechanical engineer comes at last to an end of his figures and must stand up, a practical man face to face with the discrepancies of nature and the hiatuses of theory. After the machine is finished, and the steam turned on, the next is to drive it;

and experience and an exquisite sympathy must teach him where a weight should be applied or a nut loosened.

With the civil engineer the obligation starts with the beginning. He is always the practical man. The rain, the winds and the waves, the complexity and the fitfulness of nature are always before him. He has to deal with the unpredictable, with those forces that "are subject to no calculation"; and still he must predict, still calculate them at his peril. His work is not yet in being and he must foresee its influence; how it shall deflect the tide, exaggerate the waves, dam back the rainwater or attract the thunderbolt. *** Nay and more; he must not only consider that which is, but that which may be.—Robert Louis Stevenson.

Experimental Pavement in Queens Borough

Experience with cinders and asphaltic oil on dirt roads, with alternating rows of oak and stone blocks, and special bituminous macadam.

Pavements that depart material from local prevailing practice have been constructed during the past two or three years in the Borough of Queens, New York City. At the 1920 convention of the American Society for Municipal Improvements some of these pavements were described by E. E. Butterfield and Fred H. Shepherd, the former in charge of the laboratory of that borough. At the convention this year they presented a further progress report on these pavements, giving information which we present below in condensed form.

Cinders and Oil—One of the most satisfactory experimental pavements consisted of cinders and cold asphaltic oil applied to dirt roads. The borough has between 600 and 700 miles of dirt roads which must be kept open to traffic which is continually increasing in number and weight of vehicles. Many of these roads were formerly impassible in the winter and spring, but the treatment named has given them almost the stability of macadam and after a year's service they are still in excellent condition.

In this treatment the dirt road is honed and shaped with a Ford tractor and a Jumbo road machine and the cinders are spread by laborers with coal scoops. The cinders are then slightly compacted with a 10-ton roller and asphaltic oil is applied and the roadway then given a final and thorough rolling. In 1920, 7,000 tons of cinders were used in this way and so well withstood the winter of 1920-'21 that this season the borough has already used 23,000 tons of cinders on about 25 miles of roads. The cost in 1920 was 27 cents a square yard and in 1921 25.8 cents.

Key Block Pavement—On streets of heavy traffic, which had previously been paved with blocks of basalt, granite and sandstone, worn to a cobblestone surface, a pavement has been laid consisting of alternating rows of these old stone blocks and oak wedge blocks, the latter dovetailing the rounded sides of the stone blocks, with the top of the oak wedge projecting slightly above and overhanging the surface of the stone blocks.

In laying the pavement the old stone blocks



DIRT ROAD TREATED WITH CINDERS AND COLD ASPHALTIC OIL

are taken up, culled and laid in contact in rows transverse to the direction of traffic, the rows being separated by three or four-inch spaces which are filled with the oak wedges. These wedges are rammed in tight. On steep grades the wedges are allowed to project slightly above the stones, giving a corduroy effect; but in other cases they are rammed flush with the high points of the stones and covered with bituminous mastic, which gives the smoothness of a sheet asphalt pavement. Several blocks of this pavement were laid in June, 1919, on a 7 per cent grade which is subject to a large volume of heavy trucking, much of it horse-drawn. The key block pavement is a practical, non-slippery and anti-skid pavement causing much less noise than the one previously in use. So far there has been no maintenance cost.

(Many miles of this pavement, with the oak blocks driven flush with the stone blocks have been laid by the street railways of New York City in their track space.)

Broken Stone with Bituminous Treatment—
"The underlying principle of old macadam con-



KEY BLOCK PAVEMENT ONE YEAR OLD

struction was the waterbonding of the cementitious constituents of the stone. There was no reason for following this principle of cementitious value of stone after bituminous binders superseded the haphazard practice of waterbound macadam construction, but nevertheless the antiquated principle was blindly followed.

"In the borough of Queens we have built roads by the penetration method with different mineral aggregates, generally of the same nature as would be employed in concrete construction, and the results have been uniformly good, with the reservation that the harder minerals, such as andesite and basalt, tend to wear sharp and rough."

The borough has also laid a reinforced asphaltic concrete roadway, but too recently to report any results.



CRUSHED GRAVEL AGGREGATE

Using Old Asphaltic Material in Pavement Maintenance

Method employed in Milwaukee at 35 cents per square yard for plant cost and 30 cents for street cost.

C. J. Van Etta, superintendent of street construction and repair of Milwaukee, has for nine years been developing a method of using material removed from old asphalt pavements for making repairs, and feels that he has attained a success that encourages him to pass the information on to others. This he has done in a paper read before the Baltimore convention of the A. S. M. I., in which he stated that the old material has been used for repairs since 1912 with entire success as to both cost and wearing quality.

At the start he used a small hot mixer which could not produce more than 50 or 60 yards of 3-inch surface a day and the cost ran high because of this. However, after the first season he was so convinced of the value of the old material that he designed a machine able to produce about 25,000 square yards during the season of about six months. During the past five or six years he has so increased the capacity of the plant as to be

able to produce something like a general average of 60,000 square yards of 3-inch surface in a season. The plant used is one built by Warren Bros. as a portable plant with the idea of drawing it about the city in making repairs, but it has been placed on a concrete foundation as a stationary plant and the reclaimed material repaired in it is hauled to the street by trucks. This was done because it seemed desirable to make some changes in the plant that would have been impossible with a portable mixer. With the plant as modified, the city is now producing from 300 to 700 square yards a day, the biggest day's run being 24 loads of $2\frac{1}{2}$ cubic yards each, each load making about 30 square yards of surface.

The average daily cost of operating the plant, which includes common labor, engineer, firemen, foreman and truck drivers, fuel oil and other incidentals, is about 35 cents per square yard. The street cost, which includes the tearing up, trimming joints and other work necessary to prepare the street for the new material, and the hauling away of the old material, is about 30 cents per square yard. At the plant are used 22 common laborers at 65 cents an hour, an engineer at \$1.05 an hour, a fireman at 80 cents per hour and truck drivers at \$7.20 a day. There is also a team at \$8 a day to be added to the force at the plant.

There is no set rule as to the amount of new asphaltic cement that is added to the old material, but this averages about 15 to 20 per cent. The men operating the plant have been on the work for eight or nine years and are so thoroughly experienced in handling the mixture that they can judge by the appearance of the old material about how much asphaltic cement should be added.

The wearing quality of the old re-heated mixture is remarkable. Mr. Van Etta cited two blocks of a street near the city hall that were resurfaced with this old material eight or nine years ago, just previous to the building of a bridge on the line of the main street which necessitated diverting the traffic onto this resurfaced pavement, 80 per cent of the main street traffic passing over this street. Up to date practically nothing has been spent in maintaining these two blocks.

When contracts are let for resurfacing an asphalt street they include a clause requiring the contractor to haul all of the old surface mixture, including the binder course, to the central plant and pile it at this point. This old material, including binder stone, is broken up with sledges as needed and put into the mixer to be heated to a point where it becomes workable. Breaking up by hand is expensive but up to date the city has been unable to find a crusher that would handle the material in warm weather. Last fall and early this spring a gyratory crusher was used for breaking up about 500 cubic yards and it was found that where it was crushed to material $\frac{1}{2}$ -inch diameter or less, much better results were obtained because of the short time required for softening and mixing the material. Using this crusher, only four men were required to break up the amount of material that required from 18 to 20 by hand labor at 65 cents an hour.

As soon as the weather became warm, however, the mixture became too soft for crushing. Mr. Van Etta expects to install, before next summer arrives, a crusher that will handle this material in warm weather, plans for which crusher are now under way. In connection with the new crusher it is proposed to have a belt conveyor that will carry the crushed material to a bucket conveyor which in time will raise the mixture to the hopper. At the present time it requires about 14 minutes to produce a batch of material where it is hand broken, but with the equipment now proposed it is estimated that a batch can be produced in about 8 minutes.

Debt Limit Prevents Sewage Plant Construction

The State Board of Health of New Jersey before the war ordered the town of Hackensack to erect a sewage disposal plant. Shortly thereafter the general confusion to all plans resulting from the war caused this matter to be held in abeyance, but two years ago the town was again instructed to begin work on such a plant in accordance with plans which had been adopted and accepted by the state board.

In reply to a recent notice from the state board asking why nothing had been done, Mayor Spencer D. Baldwin stated that the lowest bids received some time ago for carrying out the plans was \$1,320,000, which was \$400,000 in excess of the maximum amount to which state laws permitted the town to be bonded. He stated that the authorities intended to advertise for bids again early next year and, if those received were too high to permit construction of the entire plant, one unit would be completed in 1922 and the remainder the following year.

Quiet Pavements Near Schools

The Public School Principals' Association of Newark, N. J., has asked the city commission to adopt a paving construction program extending over, say, four years for providing noiseless pavements in the vicinity of schools, thus taking the lead among large cities of the country, which lead it was hoped and believed the other cities would follow. They stated that the constant noise at many of the schools caused by vehicles running over rough pavements prevented both teachers and pupils from carrying on their work most effectively and they believed that the greater efficiency permitted by the noiseless pavements would more than compensate for the additional cost.

A Concrete Laying Record

Another claim has been advanced for the record in laying concrete pavement, this time for the J. W. Etchison Construction Co., which is reported to have laid 863 feet of concrete pavement near Effingham, Ill., closing the gap in the Old National Trails road between Vandalia and the Indiana state line.

Recent Legal Decisions

CITY NOT LIABLE TO CONTRACTOR FOR FAILURE TO ASSESS WHERE CONTRACT VOID BECAUSE NOT LET TO LOWEST BIDDER

A street improvement contract provided, pursuant to the city charter, that payment for the improvement was to be from a special fund to be raised by assessment on the abutting property, and that the city should not be required to pay from any other fund, unless it failed to make a valid assessment. In an action by a contractor against the city to recover upon an alleged breach of the duty of the city to provide a fund to pay for the improvement, the Oregon Supreme Court holds, *Montagu-O'Reilly Co. v. Town of Milwaukee*, 199 Pac. 605, that the city was not liable for failure to make a valid assessment to pay for the improvement where the evidence showed that the contract itself was void ab initio, because it was not let to the lowest bidder as required by the charter.

CONTRACTOR ENTITLED TO ASSESSMENT ON COMPLETION WITHIN EXTENDED TIME, THOUGH CITY'S ACCEPTANCE DELAYED

The California Supreme Court holds, *Federal Const. Co. v. Newhouse*, 199 Pac. 519, that, in street improvement proceedings under the San Francisco street improvement ordinance, if the contract was actually completed within the time fixed in the contract by valid extensions, the assessment was not invalidated because it was not issued until after the time for completion had expired. If the contractor finished the work within the time required he was entitled to the assessment, even though the acceptance by the street commissioner was delayed.

DEBTS OF MUNICIPALITIES IN CALIFORNIA CANNOT BE GARNISHED THOUGH FOR PRIVATE ENTERPRISES, AS WATER WORKS CONSTRUCTION

The California Supreme Court holds, *Irillarry v. City of San Diego*, 199 Pac. 1041, that a debt due by a municipal corporation in the conduct of a private and proprietary enterprise, such as a municipal water system, may not be garnished in an action against the creditor. California is one of the states where the courts hold that municipal corporations are not subject to garnishment. The Legislature has provided in the Code of Civil Procedure a special method for the subjection of debts due from a municipality to the lien of a judgment.

CITY REJECTING CONTRACTOR'S TENDER OF PERFORMANCE CANNOT RECOVER ON HIS BOND

The Maryland Court of Appeals holds, *Title Guaranty & Surety Co. v. Poe*, 114 Atl. 481, that where one contractor agreed to take over a contract of another contractor with a municipality if he should be allowed to take over the original contractor's plant, and gave a bond for performance, but the city refused to accept his tender of performance, the surety on the bond was not liable either to the city or to the surety on the bond of the original contractor, which claimed that the second bond was for its benefit, since the second contractor's tender of performance and the city's refusal worked a discharge.

STREET IMPROVEMENT CONTRACTOR MAY RECOVER DAMAGES CAUSED BY NEGLIGENT MISTAKE IN ADVERTISEMENT AS TO AMOUNT OF EMBANKMENT REQUIRED

Where an advertisement for bids for a street improvement was inserted by virtue of the provisions of the charter prepared by the city's agents, it becomes the city's invitation to bid, and whatever representations it contains are the city's representations. When such an advertisement, by a mistake amounting to negligence, materially understated the amount of embankment which the contractor would be required to construct, it was the city's misrepresentation; and if the contractor had a right under the circumstances to rely upon it as being approximately correct, and, so relying, made a ruinous or unprofitable bid, the Oregon Supreme Court holds, *Palmberg v. City of Astoria*, 199 Pac. 630, that the city should be held liable, not on the ground of a contract, or on a quantum meruit for the reasonable value of the labor and expense of the contractor in bringing the embankment up to grade, but as damages for a negligent act inducing the contractor to enter into the contract and expend a greater sum in completing it than would have been necessary had the conditions been correctly stated. The error, however, must be due to carelessness, negligence or incompetency of the city's agent who made the mistake.

It was not necessary that the contractor should make new surveys or surveys from an independent profile on file, in order to verify the city surveyor's calculations, since he had the right to rely upon these computations as substantially correct.

It was also held that the contractor did not waive his right to recover by proceeding to complete his contract after discovery of the mistake, since a party induced by a false representation to enter into a contract may proceed to perform it and sue for damages for the misrepresentation.

PROVISION FOR PAYMENT OF DEBTS IN ROAD IMPROVEMENT BOND MAY EXCEED STATUTORY REQUIREMENT

The Oregon Supreme Court holds, *Clatsop County ex rel. Hildebrand v. Feldschan*, 199 Pac. 953, that a provision in a road improvement bond for payment of "all just debts, dues, and demands incurred in performance of the work" is valid and binding on the surety though the statute merely required the bond to be conditioned for the payment of labor and materials; and such a provision covers supplies furnished the contractor for the housing and maintenance of his men, etc., in rural districts. "Such provisions," the court said, "are in conformity to a moral duty resting upon county officials to see that its citizens and others who furnish laborers and subcontractors with materials and supplies, and extend credit to a contractor to assist in the performance of the public work, are protected. Such provisions tend to promote efficiency in the construction of the roads of a county. They are in the interest of justice and equity, and was not ultra vires."

NEWS OF THE SOCIETIES

Nov. 21—CHICAGO SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Joint meeting with Western Engineering Society.

Nov. 22—ATLANTA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

Nov. 22—PHILADELPHIA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Adelphia Hotel.

Nov. 25—COLORADO SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Metropole Hotel, Denver. Secretary, William Lester, Vulcan Iron Works.

Nov. 28-29—KANSAS CITY SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Two-day regional meeting. Secretary, Louis Bendit, 517 Finance bldg.

Dec. 1-3—MONTANA IRRIGATION AND DRAINAGE INSTITUTE. Great Falls, Mont.

Dec. 5-8—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. Omaha, Neb. Secretary, J. H. Mullen, St. Paul, Minn.

Dec. 5-9—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual convention, New York City.

Dec. 6-9—AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. 14th annual meeting, Baltimore, Md.

Dec. 13—ENGINEERING SOCIETY OF BUFFALO. Iroquois Hotel, Buffalo. Secretary, N. L. Nussbaumer, 80 W. Genesee street, Buffalo.

Dec. 14—NEW YORK SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies' building, New York City.

Dec. 15—ENGINEERS' CLUB OF CINCINNATI. Cincinnati.

Dec. 22-23—KANSAS ENGINEERING SOCIETY. Annual meeting, Hutchinson, Kan. Secretary, J. M. Averill, Topeka, Kan.

Dec. 27-31—AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, SMITHSONIAN INSTITUTE, Washington, D. C. Toronto, Canada.

Jan. 4-14—CLEVELAND, OHIO, BUILDING EXPOSITION. Municipal auditorium, Cleveland, Ohio.

Jan. 17-20—AMERICAN ROAD BUILDERS' ASSOCIATION. Annual Convention and good roads show, Chicago, Ill.

Feb. 12-17—CONFERENCE OF HIGHWAY ENGINEERING. 8th annual conference. University of Michigan, Ann Arbor, Mich.

Feb. 15-17—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Tenth midwinter convention. Engineering Societies' building, New York City.

Feb. 21-23—MINNESOTA FEDERATION OF ARCHITECTS AND THE MINNESOTA SOCIETY OF CIVIL ENGINEERS. First annual convention. Curtis Hotel, Minneapolis.

Apr. 27-30—BUILDING OFFICIALS' CONFERENCE. Apr. 27-28, Cleveland, O.; Apr. 29, Massillon, O.; Apr. 30, Youngstown, O.

May 15-19—AMERICAN WATER WORKS ASSOCIATION. Annual convention, Philadelphia, Pa.

WESTERN SOCIETY OF ENGINEERS

The November program of the Western Society of Engineers, included the following papers: "Illinia Harbor," by Col. W. V. Judson; "Layout and Design of the Modern Industrial Plant," by Frank D. Chase; "Engineering Features of Chicago's New Gas Plant," by J. I. Thompson. There will also be an "Experience Night," at which 15 minute talks will be given on personal engineering experience; and talks on "Business Management" and "Organization."

NEW YORK SECTION, AMERICAN SOCIETY OF CIVIL ENGINEERS

JOINT MEETING

Regular meeting, November 14th. Subject: "The St. Lawrence Ship Canal and Power Project."

Speakers: Hon. Henry J. Allen, Governor of Kansas; Hon. W. J. Harding, former Governor of Iowa; Dr. R. S. MacElwee, Director of the School of Foreign Service, Georgetown University, Washington, D. C., on "The Greatest Single Step Along the Boston, Mass., on "The Power and Road to National Efficiency," illustrated by lantern slides; H. I. Harriman, of Transportation Features of the Project, Translated into the Economics of New England and the East."

BROOKLYN ENGINEERS' CLUB

At the Regular Meeting November 10th, Paper No. 177, entitled: "Oxy-Acetylene Welding from a practical standpoint," was presented by Mr. Nicholas M. Powell, of The Powell Welding Co., Brooklyn, N. Y.

At the informal meeting, November 17th, Industrial Brooklyn, Paper No. 6, on the processes involved in the production of Sugar, from the plantation to the commercial product familiarly known as "Domino Sugar" was presented by Mr. Richard Mommers, General Superintendent of the American Sugar Refining Company.

On December 1st, Industrial Brooklyn, Paper No. 7, the work of the Sperry Gyroscope Co. will be described by Mr. O. B. Whittaker, Supervisor of the Service and Installation Department.

NORTHWESTERN SECTION, A. S. C. E.

At a recent meeting of the Northwestern section of the American Society of Civil Engineers held in Minneapolis, Minn., the following officers were elected: President, W. T. Walker; first vice-president, George H. Herold; second vice-president, James B. Gilman; and secretary-treasurer, Paul C. Gauger.

OHIO CONFERENCE ON WATER FILTER PLANT OPERATION

The state department of health of Ohio has called a conference to be held at the Southern Hotel, Columbus, Ohio, November 2-22, at which it is expected that every water purification plant in the state will be represented. Mayors, directors of public service and superintendents of water works have been invited to attend the conference as guests.

INDUSTRIAL RELATIONS CONFERENCE

The Industrial Relations Conference was held at Harrisburg, Pa., on October 24-27th, under the auspices of the Department of Labor and Industry of Pennsylvania. The following subjects were discussed: "Industrial Co-operation"; "The Foreign Outlook"; "Women and Children in Industry"; "Stabilizing Industry and Employment"; "Industrial Waste"; "Industrial Education"; "Industrial Publicity"; "Medical Supervision in Industry"; "Workmen's Compensation." There was also an industrial welfare exhibit at the Penn Harris Hotel, at which materials were displayed relating to in-

dustrial efficiency, such as fire prevention and protection, safety devices, illumination, firestaid, health, hygiene, welfare, etc.

ENGINEERS' CLUB OF PHILADELPHIA

The Engineers' Club of Philadelphia, announces the following addresses at its luncheon meetings: November, "Accomplishments Under the Federal Water Power Act," by O. C. Merrill; and November 29, "The Kansas City Board of Public Welfare An Interesting Experiment in Civic Democracy," by Jacob Billikopf.

TEXAS SECTION, A. S. C. E.

The Texas section of the American Society of Civil Engineers at its annual meeting on October 28th elected the following officers: President, Col. E. B. Sands; second vice-president, Major W. J. Powell; and secretary-treasurer, E. N. Noyes.

ENGINEERS' CLUB OF TRENTON, N. J.

The Engineers' Club of Trenton, was addressed on October 2th by Thomas H. Wiggin on "Two Years' Experiences in China," illustrated with lantern slides; and on November 10th by Robert Fleming on "Building Codes," with particular reference to the proposed new building code for Trenton.

HOUSTON ENGINEERS' CLUB

The Houston, Tex., Engineers' Club at its meeting on October 18th was addressed by Thomas H. Ball on "The Houston Ship Channel and Its Future." The following officers have been elected: President E. G. Maclay, first vice-president, E. M. Wise; second vice-president, R. J. Cummins; third vice-president, W. H. Mead; and secretary-treasurer, A. J. Banta.

PERSONALS

Abney, G. R., of Beaumont, Tex., has been appointed highway engineer of Angelina county, Texas.

Martin, C. A., was recently appointed construction engineer on paving and sewage work for puyallup, Wash.

At the recent elections the following mayors were elected: Indianapolis, Ind., Samuel Lewis Shank; Louisville, Ky., Judge Huston Quin; Detroit, Mich., James Couzens, re-elected; Princeton, N. J., Dr. Charles E. Browne, re-elected; Albany, N. Y., William S. Hackett; Syracuse, N. Y., John H. Walrath; Yonkers, N. Y., Walter Taussig; Oneonta, N. Y., C. C. Miller; Elmira, N. Y., J. Morton Wood; Buffalo, N. Y., Frank X. Schwab; Rochester, N. Y., C. D. Van Zandt; Schenectady, N. Y., George R. Lunn, re-elected; Lackawanna, N. Y., Michael J. Mescall, the only Socialist elected in the state; Youngstown, Ohio, George L. Oles; Cleveland, Ohio, Fred Kohler; Cincinnati, Ohio, George Prescott Carrell; and Scranton, Pa., John Durkan.

Netleton, Edward S., acting city engineer of New Haven, Conn., has been appointed city engineer.

Wehrung, J. P., has been appointed district engineer for the Falls County Road District No. 5, with headquarters at Chilton, Tex.

Ward, Robert L. E., has been appointed city engineer of Canon City, Colo.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

BACK SLOPER ATTACHMENTS

Back sloper attachments to be connected to or removed from the Adams graders are designed to cut a clean, uniform back slope, a flat bottom and inside slope at one operation and are put on the market by J. D. Adams & Co. The attachment for the road No. 12 machine has been used for more than three years for successfully digging ditches to specifications on state and federal aid roads. It is hinged to the board and is made in two sections, one to cut the flat, bottoms and one to cut the back slope having renewable blades.

The back sloper attachment for road cleaning and giant road cleaning machines are practically alike. The section that cuts the flat bottom and inside slope is bolted on the inside of the blade and the back sloping section fits around

DITCH CUT BY BACK SLOPER No 2 FOR GIANT ROAD KING.



the end of this special share and bolts to the board besides being rigidly supported by an arm bolted to the draw bar. The slopers can be attached to any road cleaning or giant road cleaning grader by quickly boring four holes in the mold boards.

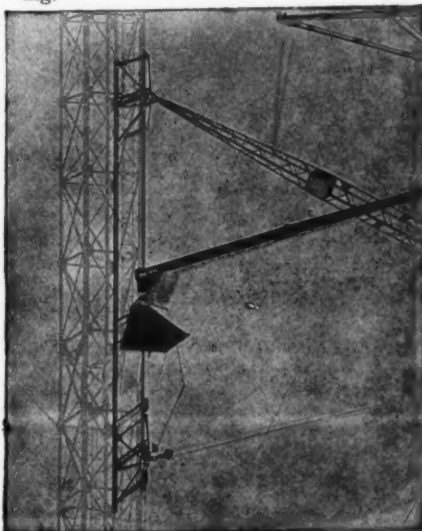
The side cutting of a back sloping attachment together with the load on the point of the blade tends strongly to pull the grader into the bank, and are offset with the Adams graders by leaning the front wheels.

The Adams scarifier grader No. 8-A is equipped with 3 leaning wheels and all adjustments of other Adams graders and possesses in addition a scarifier that may be used if desired instead of the 8-foot reversible regular blade. It is hauled by a tractor of required draw-bar h. p., according to the working con-

ditions. Most scarifiers and blades can be used separately or in combination, in the latter case loosening hard surfaces and removing it simultaneously.

IMPROVED SLIDING HOPPER FRAME FOR CONCRETE TOWER

The improved sliding frame on concrete towers manufactured by the Ransome Concrete Machinery Co., carries the rope bracket, boom bracket, straight backed receiving hopper and concrete chute, thus providing all required moveable connections and permitting them to be quickly shifted in a group to any required position between the top and the bottom of the tower to correspond to the different heights of hoists and to different lengths and elevations of spouting.



HOPPER, CHUTE AND BOOM, RANSOME SLIDING FRAME AND STEEL TOWER

The long light framework receives the reactions insures the correct relative spacing of different moveable units and is fitted to the corner members of

the tower and distributes the stresses over them so as to avoid the possibility of concentrated loads and the buckling of the tower posts between the channel points of the tower bracing. It engages the flanges of the tower angles so as to maintain its alignment while it is hoisted or lowered, is quickly disconnected, shifted and reconnected so that little time is lost in its adjustment.

It can be operated with the boom shown in the engraving, or with the special improved boom made with two end sections of 5-inch pipe with steel connection castings at each end of the sections. These castings provide for the pin connections at the tower and for the tackles, and they also receive the middle section of the boom made with a pair of 7-inch channels 19 inches back to back, providing a clear space 7 feet long between them for the passage of the concrete chute. This boom is very rigid and simple in construction. The regular 48-foot length weighs 1,150 pounds, as compared with an equivalent latticed boom weighing 1,570 pounds. The strength is sufficient to permit the length to be extended if necessary by the use of longer pieces of pipe for either of the end sections.

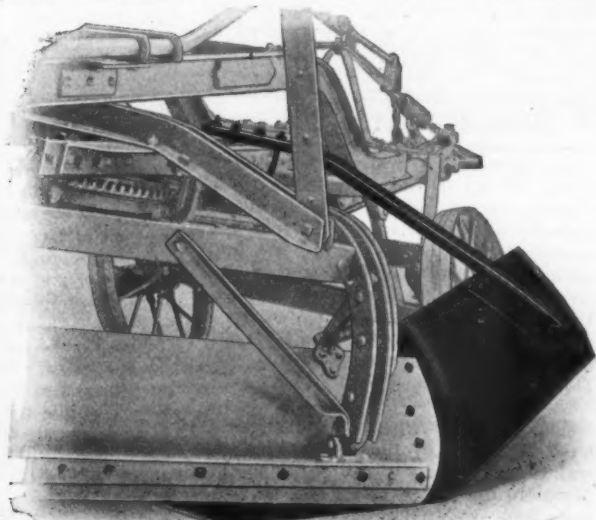
CHAMPION SNOW PLOW

The Champion Snow Plow manufactured by the Good Roads Machinery Co., Inc., has been designed to meet the demand for rapidly and conveniently cleaning city streets and country roads from snow and ice during and after snow storms. Installed on a motor truck it is able to move with the traffic and ahead of the traffic, and clear the street without blocking it. It has been developed during the last 5 years and can now be attached to any truck or tractor quickly.

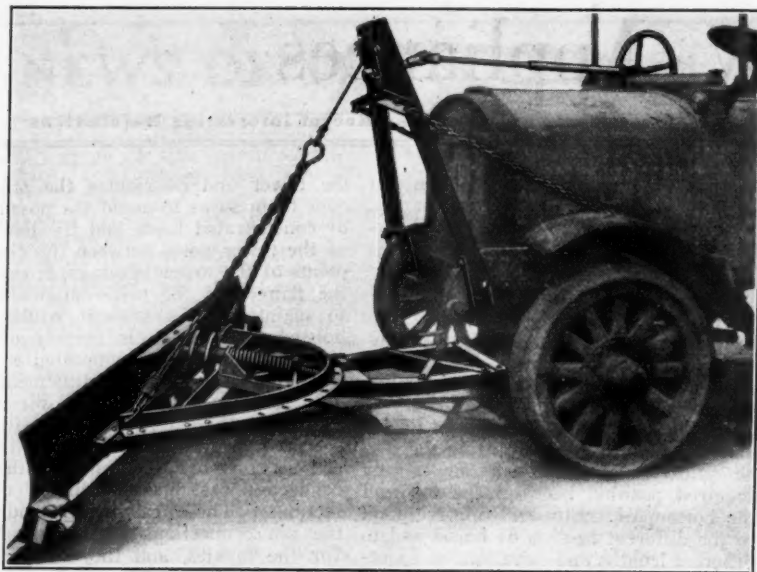
It consists essentially of a steel scraper blade 10 feet long and 16 inches wide, hung to a semi-circular steel frame, providing angular adjustments



GRADER IN INCLINED POSITION MAINTAINED AT CORRECT ANGLE TO CUT ACCURATE SLOPES BY LEANING WHEELS



BACK SLOPER ATTACHMENT FOR ROAD KING AND GIANT ROAD KING



ADJUSTABLE SNOW PLOW INSTALLED ON MOTOR TRUCK

and making it possible to set the scraper blade at any desired angle for right or left hand cutting. The angle is changed and fixed by setting a pin in the semi-circle.

The principal advantages of the Champion plow include the automatic blade connection that permits the blade to pass over obstructions and immediately return to operating position; the universal axle clamp built to be attached to any truck having I-beam or rectangular section of front axle; the universal lifting device consisting of a hand wheel and worm gear that can be easily and quickly attached to any make of truck; the tilting device that moves the scraper blade backward and forward with a wheel or screw mechanism to suit any condition of snow removal and the 5 x 16-inch mold board 10 feet long and 4 feet wide with a 6 x 1/4-inch carbon steel edge 10 feet long that can be renewed.

Large numbers of the Champion Snow Plow have been used by the Street Highway Departments of Pennsylvania, 500 are in use for the street cleaning in New York and many are used in other states and cities. The catalog illustrates them in service attached to various makes of trucks, tractors and steel mules and to a motor chassis.

INDUSTRIAL NOTES

The Bucyrus Co. announces the removal of its New York office to 30 Church Street, with E. G. Lewis as Eastern sales manager, effective December 1st. M. J. Woodhull has been appointed general sales manager to succeed Mr. Lewis in Chicago, and E. R. Weber, Northern sales manager at Minneapolis to succeed J. N. Gawthrop, who will become associated with Mr. Lewis in New York.

The waterworks at Hopewell, Va., have been sold by the Du Pont Chemical Co. to the Industrial Service Corporation of Virginia, which corporation took over the operation of the plant November 1st, with J. F. Muhlig

as general manager and operating head of the new corporation.

The Austin Machinery Corporation announces that the Canadian Austin Machinery, Limited, Woodstock, Ontario, incorporated under the laws of Canada, will henceforth act as sole manufacturers and distributors in Canada of the complete Austin line of earth-moving and concrete-mixing equipment.

The Consolidated Expanded Metal Companies, Braddock, Pa., announce the opening of a direct branch office and eastern distributing warehouse at 537 West 35th St., New York City. The new sales office will be under the personal direction of Thomas R. Herbest, Jr., who during the past seven years has established and operated similar distributing stations for this Company in Philadelphia and Pittsburgh.

The Bucyrus Company announces the removal of its New York office to suite 728, 30 Church Street, with E. G. Lewis in charge as eastern sales manager, effective December 1. M. J. Woodhull is appointed central sales manager to succeed Mr. Lewis in charge of the Chicago office, 622 McCormick Building.

E. R. Weber is appointed Northern Sales Manager, at Minneapolis, 1224 McKnight Building to succeed J. N. Gawthrop, who will become associated with Mr. Lewis in New York.

Ben. L. Whitney formerly with the Byers Co. has opened an office at 528 Detroit Savings Bank Bldg., Detroit, Michigan, and will represent the Orton & Steinbrenner Co. in that territory.

The Perfection Hoist & Engine Co., formerly of Milwaukee, Wis., has opened up a new factory at Two Rivers, Wis., for the manufacture of its "Perfect horizontal mechanical hoist" and the "Perfectlite" isolated light and power plants for farm homes.

The Universal Crane Co., Elyria, Ohio, has appointed George L. Sawyer

to represent it in the New York field in the sale of Universal cranes, with office at 141 Center street, New York City.

EXHIBITS AT THE A. S. M. I.

In connection with the convention of the American Society of Municipal Improvements held in Baltimore October 25th to 28th, a number of firms dealing in materials used by municipalities in public work exhibited samples and literature of their materials in neatly constructed booths in the convention room and the hallway leading to it. The idea of having booths in the convention hall was not a happy one, as it was necessary either for the exhibitors to entirely forego the use of their booths for discussing their products with interested parties, or to interfere with the meetings of the convention by holding such discussions. It is greatly to the credit of the exhibitors that they absolutely adhered to the former, much to their own disadvantage. Certainly if they are consulted no future conventions of this or other societies at which exhibits are presented will try to combine the exhibit and convention hall.

Those who rented booths at this convention were the following: Granite Paving Block Manufacturers Association, PUBLIC WORKS, Wayne Iron Works, Holt Manufacturing Co., Elgin Sales Corp. Manufacturers' Record, Asphalt Association, Engineering News-Record, Engineering and Contracting, American City, Fidelity and Deposit Co., John C. Louis, National Paving Brick Manufacturers' Association and Eastern P. B. M. A., Hastings Pavement Co., Standard Oil Co. of New Jersey, Dorr Co., National Steel Fabric Co., Barrett Co., Lock Joint Pipe Co., Koehring Machine Co., Dunn Wire Cut Lug Brick, Warren Bros. Co., Core Joint Concrete Pipe Co., Portland Cement Association, Austin-Western Road Machinery Co., Henry H. Meyer Co., Pioneer Asphalt Co., Celite Products Co., Texas Co., W. & L. E. Greeley, The White Co., East Iron & Machine Co., Asphalt Refining Co., International Motor Co., Peerless Weighing Machine Co., Modern City.

NEW CALCULATING MACHINES

The Monroe Calculating Machine Company has just brought out a new model calculating machine to be made in three sizes, 12 to 20 place capacity. Special features of these machines include light keyboard touch and easy crank turn; one stop operating crank; removable operating crank; dial clearout; repeat and non-repeat keys, speed with accuracy and visible proof.

THE UNITED STATES CAST IRON PIPE AND FOUNDRY COMPANY

The United States Cast Iron Pipe and Foundry Company, Burlington, N. J., has opened a new office at 811 Dixie Terminal Building, Cincinnati. P. T. Laws, Assistant Works Manager, will make this point his headquarters. Sales from this office will be in charge of Mr. Harold G. Henderson.

ZONING IN NEW HAVEN

It has been announced that Mayor Fitzgerald of New Haven, will promptly put into force that city a new zoning law, passed by the last Connecticut Legislature to give aldermen power to regulate the operation in various parts of the city.